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Overview of the KSTAR Research in Support of ITER and DEMO

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The KSTAR device has been operated since the first plasma in 2008 with the mission of exploring the physics and technologies of high performance steady-state operation that are essential for ITER and fusion reactor. KSTAR has been focusing on maximizing performance and extending pulse length targeting H-mode dischage up to 300s at higher plasma current up to 2 MA, and at higher normalized beta (βN) up to ˜5.
In the 2015 campaign, various long pulse H-mode discharges
have been operated after the improved plasma shape control, and a longest H-mode discharge was achieved up to 55 s at 0.6 MA in plasma current and 2.9 T in toroidal field utilizing 4.2 MW neutral beam and 0.65MW ECCD systems. This will be the longest H-mode discharge in tokamak devices. Fully non-inductive discharges have been carried out at the reduced plasma current of 0.4 MA to access the steady-state operation condition. The first fully non-inductive operation was achieved with relatively high plasma performances (βN ˜ 2.1 and βP ˜ 3.0). However the shot was terminated at about 16s due to the excessive heat in poloidal limiter.
KSTAR device could be an ideal device to investigate the basic of the stability limits and confinement improvement utilizing unique features of KSTAR such as extremely low error field, versatile in-vessel control coils (IVCC), and advanced 2D/3D imaging diagnostics. In this paper, the progress of the KSTAR research to support ITER and DEMO will be reported.

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